

REMARKS

Claims 1-12 are pending in the application, with Claims 1 and 8 being independent claims. Claims 6, 7 and 12 are objected to for informalities. The Examiner has requested information pursuant to 37 C.F.R. § 1.105 regarding FIGS. 1, 4, and paragraphs 10-12, 17 and 18 of the corresponding Published Patent Application No. 2004/0146025 A1. Claim 1 is rejected under 35 U.S.C. § 112, second paragraph, for antecedent basis reasons. Claims 8-14 are rejected under the judicially created doctrine of obviousness-type double patenting (ODP) as being unpatentable over claims 1-14 of #493 (copending Application No. 10/695,493). Claims 8-14 are rejected under ODP as being unpatentable over Claims 1-18 of #197 (copending Application No. 10/694,197) in view of Walton (U.S. Patent Application Publication No. 2004/0156328 A1). Claims 1-5 and 8-11 are rejected under 35 U.S.C. § 102(a) as being anticipated by Shibutani (U.S. Patent Application Publication No. 2003/0002518 A1). Claims 6, 7 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Shibutani in view of Walton (U.S. Patent Application Publication No. 2004/0156328 A1).

Please amend Claims 1, 6, 7, 8 and 12 as set forth herein. No new matter has been added.

Regarding the Examiner's request for information pursuant to 37 C.F.R. § 1.105 regarding FIGS. 1, 4, and paragraphs 10-12, 17 and 18 of the corresponding published patent application, Applicants filed Information Disclosure Statements on March 24, 2004 and March 29, 2004 that include information relevant to these sections of the application. It is respectfully asserted that Applicants are not aware of any additional information relevant to these sections of the application.

Regarding the ODP rejections of Claims 1-12, Applicants hereby reserve the right to file terminal disclaimers to overcome these rejections, at a later time in this prosecution.

Regarding the rejection of Claim 1 under 35 U.S.C. § 112, second paragraph, and the objections to Claims 6, 7 and 12, the Examiner states that the phrase "the modulation symbol

streams output”, recited in Claim 1, line 11, has insufficient antecedent basis. Applicants respectfully disagree with the Examiner regarding the rejection of Claim 1 under 35 U.S.C. §112, second paragraph, because the preamble of Claim 1 recites, in part, M modulators for modulating information bit streams output from P encoders in a predetermined modulation scheme and outputting modulation symbol streams, which clearly provides antecedent basis for the phrase “the modulation symbol streams output” subsequently recited in Claims 1-3. Claims 6-7 and 12 have been amended to correct the objection. Accordingly, withdrawal of the § 112, second paragraph rejection and the claim objection are respectfully requested.

Independent Claim 1 has been amended to recite, in part, an apparatus for transmitting a sequence for channel estimation in a mobile communication system including M transmission antennas, P encoders for receiving P information bit streams and encoding the received P information bit streams with a space-time trellis code (STTC), and M modulators for modulating information bit streams output from the P encoders in a predetermined modulation scheme and outputting modulation symbol streams, the apparatus including a sequence generator for generating the sequence for the channel estimation; M puncturers for puncturing at least one modulation symbol in a predetermined position for each of the modulation symbol streams output from the M modulators, and inserting the sequence in the at least one punctured modulation symbol; and M multiplexers individually connected to the M transmission antennas, for multiplexing signals output from the M puncturers and the sequence inserted in the at least one punctured modulation symbol.

The Examiner alleges that Shibutani discloses all of the recitations included in Claims 1-5 and 8-11. Shibutani describes a slot assignment algorithm for wireless communication systems that support adaptive modulation and coding schemes. Shibutani shows an Access Point (AP) 140 and an Access Terminal (AT) 150 in FIG. 3 that can use the Shibutani slot assignment algorithm. The AP 140 includes a data buffer 141, an encoder 142, an AP controller 143, a modulator 144, an interleaver 145, a puncturer 146, a multiplexer 147, a transmitter 148 and a receiver. In paragraph 40, Shibutani explains that the encoder 142 executes error coding on the data supplied from the error buffer 141 using Turbo coding.

Shibutani expressly states in paragraph 43 that the interleaver 145, the puncturer 146 and the multiplexer 148 are conventional and standard. Shibutani is directed to a scheduling algorithm that guarantees minimum data transport service for ATs with poor channel conditions. Shibutani merely shows the AP 140 and the AT 150 for using the Shibutani scheduling algorithm. Shibutani shows a TDMA frame in FIG. 4 and explains how each frame includes two pilot symbols inserted therein. As shown in FIG. 4 of Shibutani, when a pilot sequence is transmitted, no information data is transmitted, thereby decreasing a data rate.

It is respectfully asserted that Shibutani nowhere suggests encoding bit streams with an STTC and nowhere suggests transmitting a sequence for channel estimation. Shibutani also nowhere suggests a sequence generator for generating a sequence for channel estimation, and nowhere suggests inserting the sequence in the at least one punctured modulation symbol, as recited in Claim 1. Shibutani also nowhere suggests transmitting the sequence in substitute for at least one modulation symbol in a predetermined position through M transmission antennas, for each of the modulation symbol streams output from M modulators, as recited in Claim 8. Walton fails to supplement the deficiencies of Shibutani.

In contrast, the present invention periodically punctures a transmission period of information data and transmits a pilot sequence for the punctured transmission period, instead of separately defining a transmission period of a pilot sequence. As a result, in a mobile communication system using STTC according to the present invention, information is transmitted even during transmission of the pilot sequence, thereby increasing a data rate and improving system performance.

More particularly, it is respectfully asserted that Shibutani, Walton, or any combination thereof, fails to teach or reasonably suggest an apparatus for transmitting a sequence for channel estimation in a mobile communication system including M transmission antennas, P encoders for receiving P information bit streams and encoding the received P information bit streams with a space-time trellis code (STTC), and M modulators for modulating information bit streams output

from the P encoders in a predetermined modulation scheme and outputting modulation symbol streams, the apparatus including a sequence generator for generating the sequence for the channel estimation; M puncturers for puncturing at least one modulation symbol in a predetermined position for each of the modulation symbol streams output from the M modulators, and inserting the sequence in the at least one punctured modulation symbol; and M multiplexers individually connected to the M transmission antennas, for multiplexing signals output from the M puncturers and the sequence inserted in the at least one punctured modulation symbol, as recited in Claim 1. Shibutani, Walton, or any combination thereof, also fails to teach or reasonably suggest transmitting the sequence in substitute for at least one modulation symbol in a predetermined position through M transmission antennas, for each of the modulation symbol streams output from M modulators, as recited in Claim 8.

In contrast to the present invention, in which the claims are directed to an apparatus and a method for transmitting a data modulation symbol, together with a pilot sequence in the time period in which the sequence is transmitted, thereby increasing a data rate, the cited prior art in the rejection fails to make this disclosure.

Accordingly, Applicants respectfully believe amended Claims 1 and 8 are allowable over Shibutani, Walton, or any combination thereof.

While not conceding the patentability of the dependent claims, *per se*, Applicants believe Claims 2-7 and 9-12 are also allowable for at least the above reasons.

Independent Claims 1 and 8 are believed to be in condition for allowance. Without conceding the patentability *per se* of dependent Claims 2-7 and 9-12, these are likewise believed to be allowable by virtue of their dependence on their respective amended independent claims. Accordingly, reconsideration and withdrawal of the rejections of dependent Claims 2-7 and 9-12 is respectfully requested.

Accordingly, all of the claims pending in the Application, namely, Claims 1-12, are believed to be in condition for allowance. Should the Examiner believe that a telephone conference or personal interview would facilitate resolution of any remaining matters, the Examiner may contact Applicants' attorney at the number given below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul J. Farrell", written over a horizontal line.

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